rapid dilatation and version. The use of elastic bags may lead to accident as in Jardine's case.[1] In inducing labor for contracted pelvis and placenta prævia, a De Ribes bag was introduced as a dilator. The bag burst and the fluid which it contained rapidly separated the placenta, causing sudden and severe hemorrhage.

The later weeks of pregnancy give opportunity for a most useful study of the pregnant patient, by which the possibilities for spontaneous labor may be ascertained, abnormalities detected, complications foreseen, and such measures taken as to conduct the woman and her child safely through the perils of parturition. A physician loses a great opportunity not only to enhance the welfare of his patient, but to increase his own knowledge and skill if he neglects this period of gestation.

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## SOME APPLICATIONS OF STATIC ELECTRICITY IN DERMATOLOGY.[2]

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STATIC electricity as a therapeutic aid was first employed in America by Benjamin Franklin, about one hundred and fifty years ago. He placed patients on an insulated stool, charged them from a simple frictional machine, and drew sparks from various parts of the body. He also charged large Leyden jars, and discharged them through the patient. With this technic he benefited temporarily or permanently a few cases of paralysis. Others, both in America and abroad, employed static electricity to a limited degree, extending somewhat its range of application.

The voltaic cell, however, came into notice as a therapeutic agent and gained many adherents, in consequence of the simplicity of its operation, and static electricity was relegated to the background. The earlier types of cell—zinc-platinum (Grove) and zinc-carbon (Bunsen), both employing porous cups and strong acids—were inconvenient, insomuch as it was necessary to dismantle and clean them immediately after use. The Smee (zinc-platinized silver) and the Grenet (zinc-carbon), each requiring but a single fluid, rapidly displaced the Grove and Bunsen types, and shared the popularity accorded the Daniel cell and its modifications. An efficient apparatus, however, adapted to general use, required a battery of from twenty to forty cells, capable of generating a current of from twenty to eighty volts, according to the type of cell employed. The current from such a battery flows continuously in one direction.

The studies of Faraday later led to the introduction of a new type of electrical apparatus which is frequently called after his name. This consisted essentially of one or more voltaic cells, a soft iron core and hammer, and two concentric coils of copper wire, insulated from each other; the outer coil having a longer and finer wire than the inner. The circuit from the cells traversed the inner coil, and being broken by the interrupter, generated or induced a current of higher voltage in the outer coil. Instead of using voltaic cells to generate the primary current, the constant direct current from a dynamo may be conveniently employed as I have formerly shown (*New York Medical Journal*, July 11, 1891). Instead of the magnetic interrupter, the initial current may be broken by some mechanical device, as a toothed wheel revolved at a rapid rate by an electro-motor. If Leyden jars or preferably flat condensers be added to the installation and properly connected up as in the Ruhmkorff, a current of still higher tension is obtained. If again, instead of the apparatus being actuated as above, the initial current be taken from a dynamo giving an alternating current, the magnet, and hammer, and the toothed wheel may be dispensed with, and the apparatus be both simplified and rendered more energetic. Some ten years ago Tesla developed this phase to a higher degree than any of his predecessors. In other words, he produced an apparatus that yielded a current characterized by an exceedingly high frequency of alternation, and of a voltage or tension that was a surprise to the world. Concerning the current he wrote as follows: "We operate a coil either from a specially constructed alternator capable of giving many thousands of reversals of current per second; or by disruptively discharging a condenser through the primary, we set up a vibration in the secondary circuit of a frequency of many hundred thousand or millions per second, if we so desire; and in using either of these means we enter a field as yet unexplored."[1]

This field has now been quite thoroughly explored from a physiological and therapeutic standpoint by d'Arsonval, Apostoli, and others. Briefly the effects of this H. F. (high frequency) and H. P. (high potential) current on the human system are an increased utilization of oxygen, an increased elimination of carbonic acid, and an increase in the general metabolism. In other words, it acts as a tonic, or, as I would prefer to term it, an energizer. This statement has been borne out by both clinical experience and scientific experiment. The local effects of this current I shall not allude to here, as those who are sufficiently interested can delve into the ample literature of the subject.

The distinguishing features of the Tesla current are the extreme rapidity of the reversals or oscillations of the current, so great indeed as to defy measurement and almost to defy computation, and accompanying the high frequency the potential is raised to a point and that seems incredible. This type of current, however, was already known to the world through the labors of Dr. William J. Morton, who first drew attention to the "static induced" current in various affections, and thus established a new era in electro-static therapeutics.[2]

Some have endeavored to detract from the credit due Morton in respect to the use of this current, claiming that generations ago its existence had been demonstrated. Be that as it may, it was certainly Morton who first used it systematically in the treatment of disease, and made public the fruits of his experience. Thousands of people had seen steam issuing from the spout of the tea-kettle, but the world waited for a Watts to harness this powerful agency and adapt it to so many useful purposes.

The physiological effects of the ordinary "faradic machine" consist in little more than localized muscular contractions, accompanied with more or less pain, but so far as I have been able to observe, the current possesses but little constitutional influence.[3] With the static induced current, on the other hand, one may obtain simultaneous tetanization of a large number of muscles with little or no pain, and constitutional effects similar to those obtained with the H. F. and H. P. currents derived from the D'Arsonval apparatus.

Static electricity and high-frequency currents have for some time been successfully employed in the treatment of certain cutaneous affections, more perhaps in

[1] Glasgow Medical Journal, January, 1898.

[2] Read at a meeting of the New York Dermatological Society, September 25, 1900.

[1] "Experiments with Alternating Currents of High Potential and High Frequency." New York, 1892.

[2] MEDICAL RECORD, April 2, 1881.

[3] I am not unmindful of the claims made in behalf of Beard's "general faradization."

Europe than in America; and I am enabled by personal experience to corroborate in great measure the claims that have been made in their behalf.

Desiring to use in dermatologic practice high-frequency currents of even higher potential than those of the static induced current, my thoughts turned to the use of the Tesla oscillator, which would involve the installation of an alternating dynamo, condensers, and an up-step transformer. Tesla, however, states, as already quoted, that his H. F. and H. P. currents may be obtained by "disruptively discharging a condenser through the primary of a coil." All that would be necessary, therefore, would be to connect the coarse inner wire of a suitable coil in series with the static induced current.

Mentioning my requirements to Dr. Harry F. Waite, of this city, he constructed an up-step transformer that has yielded the most satisfactory results. The transformer itself consists of an inner coarse wire, the terminals of which are connected to the outer coatings of the Leyden jars of a large static machine. A long coil of fine wire surrounds the inner coil, and the whole is very thoroughly insulated by a modification of the Tesla insulation. The outer case measures seven by seven by twelve and one-half inches. From one side project the terminals of the primary, and from each end the terminals of the secondary coil. The Leyden jars are twelve inches in height and four in diameter, and the inner and outer coatings extend to within two inches of the top. If the static machine be now brought into action, with the sliding poles separated so as to give a spark gap of two or three inches, electric streams issue from the terminals of the secondary coil. If the hand be brought to within about two inches of either terminal, a spark appears to leap forth and pierce the skin. The impact, however, is absolutely painless, in fact barely perceptible to the senses, in this respect quite unlike other static sparks. If fifty or a hundred of these sparks be directed to one point, the skin becomes slightly reddened, and the blush remains for several hours or even a day or two. The same phenomena appear whichever terminal is approached. If one terminal is grasped firmly with the hand there are absolutely no sensation and no muscular contraction, and the same is true even if both poles be grasped, one in either hand. It would seem almost beyond belief that an alternating current, with its millions of oscillations per second and its immeasurable voltage, also (by calculation) in the millions, should thus traverse the body without affecting it to a degree appreciable to the senses. Yet such is the case. Whether this current produces any physiological, constitutional, or metabolic effects, I have not determined, as my observations thus far have been confined to a study of its local effects on cutaneous lesions.

The most convenient way of applying the current is by means of special electrodes. One of these is a metallic point with insulated handle, and the other a closed glass tube about five inches long and three-fourths of an inch in diameter, with an inner coating of tin foil. This also has a long, well-insulated handle. The electrodes should be connected to the terminal of the secondary coil by means of a well-insulated cord, and when in use kept free from any possible conductor, as otherwise a portion of the current will be dissipated. From the character of the current it may be conveniently termed a high-tension oscillating current, or briefly H. T. O. As the term "secondary," however, has been applied to the static induced current, the one here described may, with equal propriety, be termed tertiary.

My use of this tertiary current has been chiefly in connection with chronic infiltrated eczema, rosacea, acne, localized pruritus, pityriasis capitis, the localized so-called "eczema seborrhoicum" and seborrhœa oleosum, in all of which resolution of the lesions has been accomplished more rapidly than by any means previously at my command.

Addendum. It has already been stated that if the terminals of the secondary coil of the transformer be grasped, one in either hand, there is absolutely no sensation or apparent muscular action. If, however, one hand be removed, say half an inch from one of the terminals, muscular contractions immediately ensue. This led me to intercalate Ranney's device for regulating the spark gap, and by means of it, generalized contractions can be controlled with the utmost nicety; ranging from those barely perceptible up to those that are hardly bearable. If asked concerning this current, "*Cui bono?*" my only present reply must be "*Quien sabe.*"

As a further experiment I placed the Ranney regulator in series with the primary coil of the transformer, and obtained a current apparently more energetic than when it was in series with the secondary, but both sparks and muscular contractions were more painful, and the cutaneous reaction was greater. It reminds me, in fact, of the effects obtained with a high-frequency machine in which an alternating dynamo is the source of energy; in other words, of the Tesla current. I have not as yet made any therapeutic use of this modification of the current, but would not be surprised if it should prove useful in some of the profounder lesions of the skin.

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## OBSERVATIONS ON THE SURGERY OF THE GALL TRACTS.[1]

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The surgery of the gall tracts may be said to have begun about twenty years ago. In 1879, Lawson Tait did his first cholecystostomy for removal of gall stones. This marks the opening of this field to the operations of the surgeon. Its development has been slow when compared with other departments of abdominal surgery. The complicated apparatus for storing and discharging the bile, together with much that was obscure as to its properties and uses, gave rise to many complicated problems in diagnosis and operative procedure, for solution by the surgeon. These difficulties have made progress slow and hesitating. These questions have engaged the attention of a multitude of workers all over the world and not only among surgeons. Their solution has been contributed to largely by the work of the physician, the physiologist, and the bacteriologist. Chemistry and pathology have lent their aid. The complete solution of any of them cannot yet be said to be an accomplished fact. A very great deal of work still remains to be done. The subject still remains a live one. As its investigation has been pushed along by a multitude of isolated workers, so it must be carried to something like finality in the same way.

Each year gives an added importance to the biliary apparatus as a factor in disease, as we understand it. Next to the appendix and the uterine appendages, it is the avenue by which serious disease most often enters the abdominal cavity.

Disease of this part mimics many other troubles. Many dyspeptic symptoms, nausea, vomiting, gastric pain, and discomfort are often traceable to this cause.

[1] Read before the Oregon State Medical Society, June 26, 1900.